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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/812,347	03/30/2004	Fumihiko Higuchi	071469-0307558	2682
909	7590	06/07/2006	EXAMINER	
PILLSBURY WINTHROP SHAW PITTMAN, LLP			CHEN, KIN CHAN	
P.O. BOX 10500			ART UNIT	
MCLEAN, VA 22102			PAPER NUMBER	

1765
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/812,347	Applicant(s) HIGUCHI ET AL.	
	Examiner Kin-Chan Chen	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 May 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 and 24-30 is/are pending in the application.
 4a) Of the above claim(s) 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 and 24-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>02082006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of claims 1-22 and 24-29, cancellation of claim 23, and withdrawal of claim 30 are acknowledged. The traversal is on the ground(s) that claim 30 (group II) sufficiently overlaps the search and examination of the subject matter of group I (claims 1-22 and 24-29). This is not found persuasive because the apparatus as claimed can be used to practice another and materially different process such as vapor deposition process. Besides, the method of group I and the apparatus of the group II are under different classifications and involve different search (e.g., applicant may amend the apparatus claims by adding various apparatus features and limitations during the prosecution) that would be a serious burden on the examiner. The requirement is still deemed proper and is therefore made FINAL. A complete reply to the following rejection must include cancellation of nonelected claims or other appropriate action.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been

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obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-22 and 24-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomoyasu et al. (US 2004/0185583; hereinafter "Tomoyasu").

Applicant states that the instant application is assigned to Tokyo Electron Limited by an assignment filed June 24, 2004 is acknowledged. The fact that the reference and the application have the same assignee is **not**, by itself, sufficient evidence. The common ownership must be "at the time the invention was made." Since the assignment of June 24, 2004 is later than the application's filing date, it is not sufficient to overcome the rejection.

In a method for chemical oxide removal, Tomoyasu (abstract; ([0007], [0059],[0074], [0200]; Fig. 2) teaches that a chemical oxide removal process may be performed using a process recipe including setting an amount of a first reactant , a second reactant such as NH₃, HF, H₂, O₂, CO, CO₂, Ar, He, see [0200]. Hence, it would have been obvious to one with ordinary skill in the art to **use these gases and combinations thereof** . Tomoyasu [0007, lines 4-5] teaches setting an amount of an inert gas in order to achieve the trim amount. Tomoyasu teaches that the feature may be chemically treated by exposing the substrate to the process recipe and substantially removing the trim amount from the feature. Tomoyasu [0007] teaches the claimed variable parameters (setting a pressure, setting a temperature of substrate, setting a time period, setting a temperature of the process). Tomoyasu teaches changing flow rates of chemical treatment gases (e.g., gas flow rates of HF, NH₃, or inert gas).

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Tomoyasu also teaches thermally treating the substrate and rinsing the substrate following the chemical treating. Tomoyasu ([0007], [0074]) teaches adjusting the amount of inert gas (gas flow rate) in order to remove the desired amount of the chemical oxide. Tomoyasu teaches using charts, and various models for analysis, therefore, hence, it would have been obvious to one with ordinary skill in the art to use curve fitting and polynomial expressions (claims 1, 12, 24-26) to determine the relationship. Tomoyasu clearly shows that process parameters and composition of chemical treatment gases are result-effective variables. The process of conducting routine experimentations so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality or new, unexpected results, a person having ordinary skill in the art would have found it obvious to modify the prior art by performing routine experiments (by using different process parameters and compositions) to obtain optimal result with a reasonable expectation of success. As such, the relationship between a trim amount of the feature and an amount of an inert gas. The relationship may be established for an amount of first process gas, and an amount of first process may be determined.

Changes in compositions, temperature, concentrations, or other process conditions of a process do not impart patentability unless the recited ranges are critical (i.e., they produce a new and unexpected result that differs in kind and not merely in degree from the result of the prior art). *In re Woodruff*, 16USPQ2d 1934,1936 (Fed. Cir.1990); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809; *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). MPEP 2144.05 II.

As to dependent claims 11 and 21, see [0062].

As to dependent claim 22, Tomoyasu ([0007], [0074]) teaches adjusting the amount of inert gas (gas flow rate) in order to remove the desired amount of the chemical oxide, therefore, it is considered to read on claimed limitation.

The instant claims (claims 27 and 28) differ from Tomoyasu by specifying using the curve fitting including multiple regimes and using separate mass flow controller. However, Tomoyasu teaches using flow controller for the process gas. Using one controller or multiple controllers for the process is merely a matter of choices of engineering depending on product requirement, in the absence of unexpected result, it would have been obvious to one with ordinary skill in the art to choose one or the other depending on the product requirement and quality criteria of the product.

4. Claims 1, 4-8, 10-12, 15-19, 21,22, and 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Newton et al. (US 2004/0099377; hereinafter "Newton").

In a method for chemical oxide removal, Newton (abstract; ([0026], [0033], [0057], [0073],[0074]), teaches that a chemical oxide removal process may be performed using a process recipe including setting an amount of a first reactant , a second reactant. Newton teaches setting an amount of an inert gas in order to achieve the trim amount. Newton teaches that the feature may be chemically treated by exposing the substrate to the process recipe and substantially removing the trim amount from the feature. Newton teaches the claimed variable parameters (setting a pressure, setting a temperature of substrate and setting a temperature of the process). Newton teaches changing process chemical treatment gas flow rates (e.g., gas flow rates of HF, NH₃, or inert gas). As such, it would have been obvious to one with ordinary skilled in the art to determine the relationship between a trim amount of the feature and an

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amount of an inert gas. The relationship may be established for an amount of first process gas, and an amount of first process gas. The trim amount may be achieved by using the relationship. After gathering information of etching rates, thickness (trim amount), and process parameters, it would have been obvious to one with ordinary skill in the art to tabulate / extrapolate / manipulate data and perform calculation using common engineering and statistical methods (such as regression, extrapolation, best-fit, polynomial, least squares, interpolation) and numerical analysis to optimize the relationship and minimize the error as instantly claimed (e.g., claims 1, 12, 24-26). Newton clearly shows that process parameters and composition of chemical treatment gases are result-effective variables. The process of conducting routine experimentations so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality or new, unexpected results, a person having ordinary skill in the art would have found it obvious to modify the prior art by performing routine experiments (by using different process parameters and compositions) to obtain optimal result with a reasonable expectation of success.

Changes in compositions, temperature, concentrations, or other process conditions of a process do not impart patentability unless the recited ranges are critical (i.e., they produce a new and unexpected result that differs in kind and not merely in degree from the result of the prior art). *In re Woodruff*, 16USPQ2d 1934,1936 (Fed. Cir.1990); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809; *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). MPEP 2144.05 II.

Claims 27 and 28 differ from prior art by specifying using the curve fitting including multiple regimes and using separate mass flow controller. However, Newton teaches using flow controller for the process gas. Using one controller or multiple controllers for the process is merely a matter of choices of engineering depending on

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product requirement, in the absence of unexpected result, it would have been obvious to one with ordinary skill in the art to choose one or the other depending on the product requirement and quality criteria of the product.

5. Claims 1, 4-12, and 15-22, and 24-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle et al. (US 2004/0097047; hereinafter "Natzle") in view of Newton et al. (US 2004/0099377; hereinafter "Newton").

In a method for chemical oxide removal, Natzle ([0014], [0037],[0038], [0042]-[0044]) teaches that a chemical oxide removal process may be performed using a process recipe including setting an amount of a first process gas and an amount of a second process gas. Natzle [0042] teaches acquiring data as a function of variable parameters (such as temperature, composition, residence time, pressure of the process gas, the amount of reactant or the rate of process gas), **all of which can be regulated**. Natzle teaches that the feature may be chemically treated by exposing the substrate to the process recipe and substantially removing the trim amount from the feature. Natzle [0042] also discloses that the aforementioned variable parameters influence the amount removed.

The claimed invention differs from Natzle by specifying well-known feature of adding inert gas (argon) to the process gas. Newton ([0073][0074]) is relied on to show this feature. Hence, It would have found it obvious to incorporate inert gas to same in order to provide more uniform and stable etching with a reasonable expectation of success. As such, the adjustment of variable parameters discussed in Natzle is

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applicable in the combined Natzle and Newton. Thus, it would have been obvious to one with ordinary skill in the art to determine the relationship between a trim amount of the feature and an amount of an inert gas. The relationship may be established for an amount of first process gas, and an amount of first process gas. The trim amount may be achieved by using the relationship.

As to dependent claim 11 and 21, see [0014].

After gathering information of etching rates, thickness (trim amount), and process parameters, it would have been obvious to one with ordinary skill in the art to tabulate / extrapolate / manipulate data and perform calculation using common engineering and statistical methods (such as regression, extrapolation, best-fit, polynomial, least squares, interpolation) and numerical analysis (e.g., claims 1, 12, and 24-26). Claims 27 and 28 differ from prior art by specifying using the curve fitting including multiple regimes and using separate mass flow controller. However, prior art teaches using flow controller for the process gas. Using one controller or multiple controllers for the process is merely a matter of choices of engineering depending on product requirement, in the absence of unexpected result, it would have been obvious to one with ordinary skill in the art to choose one or the other depending on the product requirement and quality criteria of the product.

6. Claims 2, 3, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle and Newton as applied to claims 1 and 12 above, and further in view of Doris et al. (US 2004/0241981; hereinafter "Doris").

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The discussion of modified Natzle and Newton from above is repeated here.

Natzle and Newton are silent about the heating and rinsing with water after the chemical treating. In a method for chemical oxide removing, Doris teaches heating and rinsing with water after the chemical treating so as to efficiently remove the solid reaction product, see [0046]. Hence, it would have been obvious to one with ordinary skill in the art to modify Natzle and Newton by heating and rinsing with water as taught by Doris in order to efficiently remove the solid reaction product.

Response to Arguments

7. Applicant's arguments filed May 11, 2006 have been fully considered but they are not persuasive.

Applicant has argued that Tomoyasu teaches a process gas comprising two gases but not teaches a first process gas, a second gas, and an inert gas. It is not persuasive. As has been stated in the office action, Tomoyasu (abstract; ([0007], [0059],[0074], [0200]; Fig. 2) teaches that a chemical oxide removal process may be performed using a process recipe including setting an amount of a first reactant , a second reactant such as NH_3 , HF, H_2 , O_2 , CO, CO_2 , Ar, He, see [0200]. Hence, it would have been obvious to one with ordinary skill in the art to **use these gases and combinations thereof** .

Applicant has argued that prior art does not teach determining the relationship between a trim amount of the feature and an amount of an inert gas. The relationship

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may be established for an amount of a first process gas, and an amount of a second process gas. It is not persuasive. As has been stated in the office action, prior art clearly shows that process parameters and composition of chemical treatment gases are result-effective variables. The process of conducting routine experimentations so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality or new, unexpected results, a person having ordinary skill in the art would have found it obvious to modify the prior art by performing routine experiments (by using different process parameters and compositions) to obtain optimal result with a reasonable expectation of success. As such, the relationship between a trim amount of the feature and an amount of an inert gas. The relationship may be established for an amount of a first process gas, and an amount of a second process may be determined.

Changes in compositions, temperature, concentrations, or other process conditions of a process do not impart patentability unless the recited ranges are critical (i.e., they produce a new and unexpected result that differs in kind and not merely in degree from the result of the prior art). *In re Woodruff*, 16USPQ2d 1934,1936 (Fed. Cir.1990); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809; *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). MPEP 2144.05 II.

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the

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shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

June 5, 2006


Kin-Chan Chen
Primary Examiner
Art Unit 1765

K-C C